

What is claimed is:

2 ✓ 1. A stage assembly that moves a device, the stage assembly comprising:

4 a device table;

a stage mover assembly connected to the device table, the stage mover moving the device table;

6 a holder assembly including a device holder that retains the device and rotates relative to the device table; and

8 a holder mover assembly that rotates the device holder relative to the device table between a first position and a second position wherein at least a portion of the holder mover assembly is disposed on the holder assembly.

2 2. The stage assembly of claim 1 wherein the holder mover assembly rotates the device holder at least approximately twenty-five degrees relative to the device table about a holder axis of rotation between the first position and the second position.

2 3. The stage assembly of claim 1 wherein the holder mover assembly rotates the device holder at least approximately one hundred and eighty degrees relative to the device table about a holder axis of rotation between the first position and the second position.

4 4. The stage assembly of claim 1 wherein the stage mover

5. The stage assembly of claim 1 wherein the device holder includes
2 a stop that engages the holder assembly and provides a stop axis of rotation
for the device holder.

6. The stage assembly of claim 5 wherein the device holder rotates
2 relative to the stop about the stop axis of rotation and wherein the device holder
rotates relative to the device table about a holder axis of rotation.

7. The stage assembly of claim 5 wherein the stop engages the
2 device holder.

8. The stage assembly of claim 5 wherein the holder assembly
2 includes a carrier that is positioned between the device holder and the device
table and wherein the stop engages the carrier.

9. The stage assembly of claim 1 wherein the stage mover
2 assembly moves the device table in a semi-circular path to rotate the device
holder relative to the device table.

10. The stage assembly of claim 1 wherein the device holder rotates
2 relative to the device table about a holder axis of rotation and the holder
assembly has an assembly center of gravity that is offset from the holder axis
4 of rotation.

11. The stage assembly of claim 10 wherein the stage mover
2 assembly accelerates the device table to rotate the device holder relative to the
device table.

12. The stage assembly of claim 10 wherein the stage mover
assembly accelerates the device table to stop rotation of the device holder
relative to the device table.

13. The stage assembly of claim 10 wherein the device holder has a
2 holder center of gravity that is offset from the holder axis of rotation.

14. The stage assembly of claim 10 wherein the holder assembly
2 includes a carrier that is positioned between the device holder and the device
table and wherein the carrier has a carrier center of gravity that is offset from
4 the holder axis of rotation.

15. The stage assembly of claim 1 wherein the stage mover
2 assembly accelerates the device table to rotate the device holder relative to the
device table.

16. The stage assembly of claim 15 wherein the stage mover
2 assembly accelerates the device table to stop rotation of the device holder
relative to the device table.

17. The stage assembly of claim 1 wherein the holder mover
2 assembly includes a motor that engages the holder assembly.

18. The stage assembly of claim 17 wherein the motor engages the
2 device holder.

19. The stage assembly of claim 17 wherein the holder assembly includes a carrier that is positioned between the device holder and the device table and the motor engages the carrier.

20. The stage assembly of claim 17 further comprising a stage that
2 moves and supports the device table, wherein the motor is secured to the
stage.

21. The stage assembly of claim 20 further comprising a damper that
2 secures the motor to the stage, the damper inhibiting disturbance forces from
the motor from being transferred to the stage.

22. The stage assembly of claim 17 wherein the motor is secured to
2 an apparatus frame.

23. The stage assembly of claim 17 wherein the motor is secured to
2 the device table.

24. The stage assembly of claim 23 further comprising a damper that
2 secures the motor to the device table, the damper inhibiting disturbance forces
from the motor from being transferred to the device table.

25. The stage assembly of claim 1 wherein the holder mover
2 assembly includes a first component and a second component that interacts
with the first component, the first component being secured to the holder
4 assembly.

26. The stage assembly of claim 25 wherein the first component is
2 secured to the device holder.

27. The stage assembly of claim 25 wherein the holder assembly
2 includes a carrier that is positioned between the device holder and the device
table and wherein the first component is secured to the carrier

28. The stage assembly of claim 25 wherein the second component
2 is secured to the device table.

29. The stage assembly of claim 28 further comprising a damper that
2 secures the second component to the device table, the damper inhibiting
disturbance forces from the mover from being transferred to the device table.

30. The stage assembly of claim 25 further comprising a stage that
2 moves and supports the device table, wherein the second component is
secured to the stage.

31. The stage assembly of claim 30 further comprising a damper that
2 secures the second component to the stage, the damper inhibiting disturbance
forces from the second component from being transferred to the stage.

32. The stage assembly of claim 25 wherein the second component
2 is secured to an apparatus frame.

33. The stage assembly of claim 25 wherein the second component
2 is secured to a damper.

34. The stage assembly of claim 25 wherein one of the components
2 includes a magnet array and the other component includes a conductor array.

35. An exposure apparatus including the stage assembly of claim 1.

36. A device made with the exposure apparatus of claim 35.

37. A wafer made with the exposure apparatus of claim 35.

38. A method for making a stage assembly for moving a device, the
2 method comprising the steps of:
providing a device table that is supported movably;
4 connecting a stage mover assembly to the device table;
providing a holder assembly including a device holder that retains
6 the device; and
providing a holder mover assembly to rotate the device holder
8 relative to the device table between a first position and a second position.

39. The method of claim 38 wherein the holder mover assembly
2 rotates the device holder approximately twenty-five degrees relative to the
device table about a holder axis of rotation between the first position and the
4 second position.

40. The method of claim 38 wherein the holder mover assembly
2 rotates the device holder approximately one hundred and eighty degrees
relative to the device table about a holder axis of rotation between the first
4 position and the second position.

41. The method of claim 38 wherein the stage mover assembly
2 moves the device table to rotate the device holder relative to the device table.

42. The method of claim 38 wherein the holder assembly includes a
2 stop that engages the holder assembly and provides a stop axis of rotation for
the device holder.

43. The method of claim 42 wherein the stop engages the device
2 holder assembly and provide a stop axis of rotation for the device holder

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2 44. The method of claim 42 wherein the holder assembly includes a carrier that supports the device holder and wherein the stop engages the carrier.

2 45. The method of claim 42 wherein the stage mover assembly moves the device table in a semi-circular path when the device holder rotates between the first position and the second position.

2 46. The method of claim 38 wherein the device holder rotates relative to the device table about a holder axis of rotation and the holder assembly has an assembly center of gravity and that is offset from the holder axis of rotation.

2 47. The method of claim 46 wherein the stage mover assembly accelerates the device table to rotate the device holder relative to the device table.

2 48. The method of claim 46 wherein the stage mover assembly accelerates the device table to stop rotation of the device holder relative to the device table.

2 49. The method of claim 38 wherein the holder mover assembly includes a motor that engages the holder assembly.

2 50. The method of claim 49 wherein the motor engages the device holder.

2 51. The method of claim 49 wherein the holder assembly includes a carrier that support the device holder and the motor engages the carrier.

2 52. The method of claim 49 further comprising the step of providing a stage that supports the device table and the step of securing the motor to the stage.

2 53. The method of claim 52 further comprising the step of connecting the motor with a damper to the stage, the damper inhibiting disturbance forces from the motor from being transferred to the stage.

2 54. The method of claim 49 further comprising the step of providing an apparatus frame and the step of securing the motor to the apparatus frame.

2 55. The method of claim 54 further comprising the step of connecting the motor with a damper to the apparatus frame, the damper inhibiting disturbance forces from the motor from being transferred to the apparatus
4 frame.

2 56. The method of claim 49 further comprising the step of securing the motor to the device table.

2 57. The method of claim 56 further comprising the step of connecting the motor with a damper to the device table, the damper inhibiting disturbance forces from the motor from being transferred to the device table.

2 58. The method of claim 49 wherein the motor includes a first component and a second component that interacts with the first component, the first component being secured to the holder assembly.

2 59. The method of claim 58 further comprising the step of securing the first component to the device holder.

60. The method of claim 58 further comprising the step of positioning
2 a carrier between the device holder and the device table and the step of
securing the first component to the carrier.

61. The method of claim 58 including the step of securing the second
2 component to the device table.

62. The method of claim 61 further comprising the step of securing
2 the second component with a damper to the device table, the damper inhibiting
disturbance forces from the second component from being transferred to the
4 device table.

63. The method of claim 58 including the step of providing a stage
2 that supports the device table and the step of securing the second component
to the stage.

64. The method of claim 63 further comprising the step of connecting
2 the second component with a damper to the stage, the damper inhibiting
disturbance forces from the second component from being transferred to the
4 stage.

65. The method of claim 58 including the step of providing an
2 apparatus frame and the step of securing the second component to the
apparatus frame.

66. The method of claim 65 further comprising the step of connecting
2 the second component with a damper to the apparatus frame, the damper
inhibiting disturbance forces from the second component from being transferred
4 to the apparatus frame.

67. The method of claim 58 wherein one of the first component and
2 the second component includes a magnet array and the other component
includes a conductor array.

68. A method for making an exposure apparatus that forms an image
2 on an object, the method comprising the steps of:

providing an irradiation apparatus that irradiates the object with
4 radiation to form image on the object; and

providing the stage assembly made by the method of claim 38.

69. A method of making a wafer utilizing the exposure apparatus
2 made by the method of claim 68.

70. A method of making a device including at least the exposure
2 process: wherein the exposure process utilizes the exposure apparatus made
by the method of claim 68.

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